Minnegram Summer 2014

Director's Corner

- Summer 2014 Director's Corner

Features

- MinnAqua educator Roland Sigurdson brought fun to environmental education and everything else

  For fifteen years, DNR MinnAqua supervisor Roland Sigurdson occupied an office cube at the Water Resources Center. A scan of his desk and walls reveals a life in balance. The displays are remarkably focused, reflecting his love of family, friends, fun, education and fishing. His wife Stacey and daughter Natalie beam from multiple photos, there are childhood pictures of Roland and his siblings on the farm, images of Roland the educator before groups of fascinated children, and lots and lots of fish.

- Tourism industry report shows room for improvement in water conservation

tourism industry managers, owners and operators on sustainable practices ranging from energy efficiency to water conservation.

With one exception—sweeping large areas—there were no significant improvements by operators in the adoption of six sustainable water practices assessed across years.

- Experimenting on a grand scale: Environmental chemist Paul Capel studies glyphosate's occurrence in the environment

  While there's been lot of talk about the health and environmental effects of genetically modified crops, there's been relatively little attention paid to the environmental effects of glyphosate, a companion chemical that's now the most widely used herbicide in the world.

  Known to urban lawn warriors by its commercial name "Roundup," glyphosate is routinely applied for weed control on an agricultural scale on genetically modified corn, soybeans, alfalfa, sugar beets, and cotton in the Midwest and elsewhere.

- Sawyer Seminar Graduate Fellowship winner Jane Mazack shares her connections with insects, water and the Water Resources Science program

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Minnegram

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mmer 2014 Director's Corner

It is a fact: all good things must come to an end. Some of my best years at the University are now coming to an end: this is my final month as Co-director of the WRC, as I am stepping down as part of my phased retirement. The search for my replacement is underway, but not completed, so I will continue to help out the WRC this coming year. The University is conducting a national search, and providing for an even stronger WRC for the future. (If interested, contact search chair Assistant Dean Greg Cuomo, gcuomo@umn.edu).

I have completely enjoyed and am immensely grateful for the twelve years I have spent at the WRC. I thank the wonderful staff, those generous and talented people who collectively made everything function seamlessly and professionally every day. They always made me look good: Maria, Tracy, Bonnie, Connie, Chris, Cheryel, Jillian, Toni, Susan, and others. I thank the many scientists and educators that are and have been the engine of the WRC's productivity (you know who you are!). Finally, I thank my previous and current co-directors Jim Anderson and Faye Sleeper. It is has been a privilege to be part of this enterprising, talented, and fun group of people, all working on behalf of Minnesota water resources.

When my successor is selected, please welcome him or her warmly, and help them understand the lay of the land, the needs and unique opportunities of Minnesota. Give the new Director all the great support you have given me all these years, and they will be successful.

Happy trails,

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nnAqua educator Roland Sigurdson brought fun to environmental education and everything else

For fifteen years, DNR MinnAqua supervisor Roland Sigurdson occupied an office cube at the Water Resources Center. A scan of his desk and walls reveals a life in balance. The displays are remarkably focused, reflecting his love of family, friends, fun, education and fishing. His wife Stacey and daughter Natalie beam from multiple photos, there are childhood pictures of Roland and his siblings on the farm, images of Roland the educator before groups of fascinated children, and lots and lots of fish.

When Roland died suddenly on April 30, he left behind a legacy so far-reaching it is difficult to imagine it being generated by a single person. In his work as DNR MinneAqua program supervisor, his influence radiated like water ripples from a bobber, as he mentored interns, fished with Minnesota governors and University presidents, taught city kids the joy of fishing and became the go-to fishing guy for local media.

The MinnAqua program began in 2003 with the goal of teaching urban children to fish and through that interaction, learn environmental stewardship. Gifted with childlike enthusiasm and an infectious appreciation of the natural world, Roland was perfectly suited to mentoring young people. Like his fishing pole, humor and play were key components in Roland's curriculum. Picture after picture shows him holding the rapt attention of school children, as well as adults. Roland summed up his teaching philosophy this way: “The most rewarding times are when our program is instrumental in helping an adult and a child connect to the new activity of fishing that they enjoy together. Time on the water together leads to understanding of the resource they enjoy, participation in environmental stewardship, and fun.”

MinnAqua interns who signed on to learn about aquatic ecology and present fishing programs to children and families gained intangible lessons beyond their imagining. Former intern Chai Xiong wrote on Sigurdson’s Facebook wall: “you will continue to live and strive on and touch our hearts yet again with your kindness and wisdom that you've left on all of us. I thank you

with the utmost respect . . for your inspiration and wisdom you have given me."

Jenifer Wical, Roland's supervisor at DNR, noted the personal qualities that made Roland's environmental stewardship message accessible to a wide variety of audiences: "Roland had the heart of a child, the mind of a master, the empathy of your best friend, and the skills of an artisan. Laughter and a bounce that impersonated the best of any animated film yet effortlessly held the inquisitive attention of young and old."

Master teacher, angler, farmer, blacksmith, environmental steward, brother, son, friend, husband, and father. In all his roles, Roland never lost sight of his mission: having fun, and passing it on.

"Remember, the goal is to have fun." Roland Sigurdson, MinnAqua education coordinator with the DNR. Minnesota Department of Natural Resources press release, April 24, 2014, "How to introduce a kid to fishing."

By Christine Hansen, *Minnegram* editor

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urism industry report shows room for improvement in water conservation

Yet, Tourism Center director and Water Resources Science Graduate Program faculty member Ingrid Schneider is optimistic. “I see the results as an opportunity to educate,” she says “A portion of the industry might fail to see the economic savings in water conservation, but the bottom line is still the bottom line.”

Along with other educational and research efforts, the Tourism Center leverages University and other resources to tourism-dependent communities to help tourism owners and operators improve their bottom line in long-term, sustainable ways. The statewide survey targeted five categories of tourism-related operations that included lodging and camping owners, convention and visitor organizations, and event and festival managers on sustainable practices in areas of energy efficiency, waste minimization, environmental purchasing, air quality, landscaping for wildlife and water conservation.

The responses from the 2013 survey portion of the report show that, while some practices—like sweeping and vacuuming large areas, properly disposing of hazardous chemicals, and regularly testing and repairing water leaks—were practiced on an ongoing basis by more than 70 percent of the respondents, fewer than half of the respondents indicated any attempt to collect rainwater or install automatic run-off or reclaimed water systems.

Results were mixed on the perceived difficulty of adopting sustainable practices, with 80 percent of respondents agreeing that initial financial costs and investments of time and energy pose challenges to adoption practices. In 2013, regional differences stood out when it came to adopting practices, with respondents in Northwest Minnesota citing greater concern with financial costs, restrictions, lack of interest in the consumer base, lack of interest in the organization and even customer opposition than those in the Northeast.

Habitat conservation practices also ranged widely, with Northeast and Central Minnesota leading the pack in terms of choosing drought resistant or native groundcover. There were also differences in the practice of collecting rainwater and

stormwater, although most lodging representatives had an irrigation plan designed to conserve water and reduce evaporation.

And while more than three-quarters of respondents reported repairing leaks as part of a preventative maintenance plan, fewer reported installing water-saving fixtures and devices. More than half the respondents pointed to a lack of information on and external restrictions on operations as barriers to adopting sustainable practices.

“The regional differences are an area for more research,” Schneider says. “In Northwest Minnesota, for example, there’s a perception of more financial costs for sustainability efforts than in the Northeast. As water and environmental policies can differ by county, so too can obstacles to implementation.”

As a next step, Schneider’s team is convening meetings of University and industry experts on each topic to strategize how to help tourism industry personnel adopt environmentally smart practices that will pay off in the long run. For example, practices and solutions for the lodging sector might include more guidance on composting services; for the retail sector, more technical expertise in for the installation of occupancy sensors and water-saving features.

“Most conservation practices involve behavioral change,” cautions Schneider, “which in this case points to more communication, rather than financial or labor investment.”

The Tourism Center is a collaboration between University of Minnesota Extension and the College of Food, Agricultural and Natural Resource Sciences. For more information, visit http://www.tourism.umn.edu/

Photo credit: Explore Minnesota Tourism

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perimenting on a grand scale: Environmental chemist Paul Capel studies glyphosate's occurrence in the environment

Environmental chemist and Water Resources Science graduate program faculty member Paul Capel has spent more than a decade researching what happens to glyphosate after it's applied to agricultural fields. An adjunct associate professor in the University's Department of Civil Engineering and a research team leader with the U.S. Geological Survey's National Water-Quality Assessment Program, Capel has focused on Iowa, Indiana and Mississippi where much of the landscape is devoted to the production of corn, soybeans, cotton and alfalfa.

"We've hitched much of our agricultural wagon to the use of glyphosate," says Capel, "My perspective is that we're with glyphosate now where we were in the early days of DDT use in the 1950 and 1960s—we're conducting a big experiment with the environment."

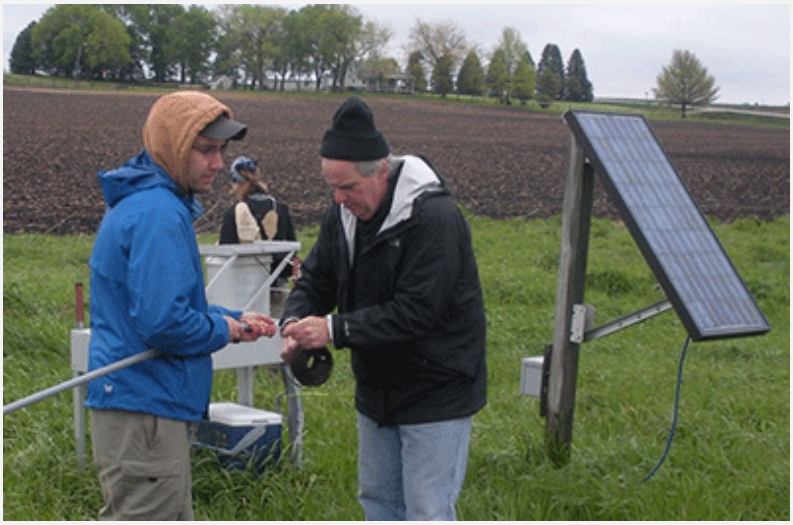
Glyphosate acts as a growth hormone, rather than a poison, interfering with a plant's EPSP synthase enzyme needed for growth. While glyphosate is not a carcinogen and is considered non-toxic to animals, there's evidence that it can have subtle adverse effects on the environment such as causing nutrient deficiencies in plants. At one time, it was thought that weeds could not develop a resistance to glyphosate, but currently 28 species of weeds have done so.

From an agronomical perspective, glyphosate has been a boon, says Capel. A broad-spectrum weed controller developed in 1970, glyphosate has revolutionized agriculture and given rise to an entire industry of "Roundup Ready" crops. In the 1990s, agricultural seed companies began to genetically engineer crops to be resistant to glyphosate. The U.S. agricultural usage of glyphosate increased from less than 11,000 metric tons in 1992, to more than 99,000 metric tons in 2009. A whopping 90 percent or more of the U.S. corn, soybean and cotton crops are now grown from glyphosate resistant engineered seeds.

Glyphosate's molecular structure is difficult to detect in the environment, making studies of its occurrence and effects time-consuming and expensive. Capel and his research partners are the first to have sampled and analyzed glyphosate in rain

and air, as wells as streams and groundwater, in Iowa, Indiana and Mississippi throughout the growing season. His research shows that glyphosate is routinely observed in streams, air and rain near these agricultural areas through the growing season and beyond.

"Though glyphosate is the mostly widely used herbicide in the world, we know very little about its long term effects to the environment," says Capel. "Our studies provide the foundation of what questions we should be asking and what toxicologists and epidemiologists will be looking for down the road."



Paul Capel (right) and Erik Smith, a graduate of the Water Resources Sciences Graduate Program, set up a rain sampler in Iowa.

Photo credit: Paul Capel

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wyer Seminar Graduate Fellowship winner Jane Mazack shares her connections with insects, water and the Water Resources Science program

What experiences in your life drive your studies? Was the path to your current research straight, or winding?

I grew up in western Michigan, but every summer my family would load up the car, pick a destination, and make a road trip across the country. Usually, the main destination was a national park – we traveled to the Grand Canyon, the Smoky Mountains, and Glacier National Park, to name a few. I was always fascinated by the beauty, diversity, and wildlife that surrounded me on those trips. At the same time, science classes were always my favorite in school. So when I began college, I naturally picked biology as my major.

Even though I knew I wanted to study biology, I didn't know what I wanted to do with my major until I took a 3-week stream ecology course in the middle of winter at the Au Sable Institute in northern Michigan. There, and at Calvin College, I had the opportunities to study aquatic insects in both lake and stream habitats, in winter and in summer. Those experiences gave me an interest in and a desire to study stream ecology. When I applied to graduate school, I mentioned that desire – I wanted to study streams, even it was in the middle of winter. It just so happened that Len Ferrington and Bruce Vondracek were looking for a student to study winter stream dynamics, and I was a great fit.

You seem to have begun your college career with the study of insects and later veered into stream ecology; how does water relate to your work with macroinvertebrates?

Macroinvertebrates are found around the world, from Minnesota to Mongolia to the Arctic. Despite the huge differences between these places, aquatic macroinvertebrates have one thing in common – they all require water to complete their life cycles. Macroinvertebrates often compose a key part of aquatic food webs, and can provide significant biomass to higher-

level predators such as fish. Additionally, macroinvertebrates are often used as bioindicators of aquatic system health. IBI (index of biotic integrity) scores are often calculated from macroinvertebrate data and used as a surrogate for ecosystem quality. There is also a long history of using macroinvertebrates to measure the influence of pollution. Many species have established tolerance values to stress; low-tolerance species are primarily found in pristine environoments.

My dissertation research focuses on the winter dynamics of macroinvertebrates in trout streams in southeastern Minnesota. In addition to quantifying invertebrate community composition, I specifically look at the emergence dynamics of winter-active invertebrate species. In southeastern Minnesota, groundwater inputs prevent streams from freezing over in the winter, thereby allowing for emergence from the water's surface year-round. I have found that water temperature significantly influences the winter macroinvertebrate dynamics in these streams.

What do you hope to accomplish after you receive your degree?

I hope to work in an agency or consulting position that allows me to continue researching and working with macroinvertebrates or streams. I'd also like to be involved with the water-related dynamics within my community.

What brought you to the WRS program? What advice would you have for new students?

I was attracted to the interdisciplinary nature of the WRS program, as well as the specific opportunity of my dissertation research. I would encourage new students to take advantage of the interdisciplinary research and classes within the program – ecology, chemistry, hydrology, and policy all influence aquatic systems. I would also advise that new students take advantage of the program's locations: the Twin Cities and Duluth are surrounded by water, so what better place to study it?

Mazack collects surface-floating pupal exuviae (SFPE) for her research from Daley Creek in Houston County, Minnesota. Many adult

macroinvertebrates

emerge from pupae at the water

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mmer 2014 Resources and Publications

Clustering chlorine reactivity of haloacetic acid precursors in inland lakes

Zeng T. and W. A. Arnold. 2014.

Environmental Science & Technology

Inland waters only cover about 1% of the Earth's surface but play an integral role in regulating the carbon cycle and climate on a global scale.1−4 Rising levels of dissolved organic matter (DOM) in inland lakes and streams have been observed in North America and Europe. Article>>

Phytoestrogens in the environment: I. Occurrence and exposure effects on fathead minnows. Environmental Toxicology and Chemistry

Rearick, D.C., N. T. Fleischacker, M. M. Kelly, W. A. Arnold, P. J. Novak and H. L. Schoenfuss. 2014.

Naturally occurring phytoestrogens may mimic biogenic estrogens and modulate endocrine action in vertebrates. Little is known, however, about their temporal and spatial variability in the environment and the biological effects associated with exposures. The present study assessed the environmental presence of phytoestrogens in human-impacted and relatively pristine areas. Article>>

Managing the biological, economic, and social aspects of sustainability of lake ecosystems

Baker, L.A. and R.M. Newman. 2014.

Pages 76-86 in S. Ahuja, Comprehensive Water Quality and Purification, Volume 4, Elsevier.

Lacustrine responses to decreasing wet mercury deposition rates—results from a case study in northern Minnesota

Brigham, M.E., Sandheinrich, M.B., Gay, D.A., Maki, R.P., Krabbenhoft, D.P., and Wiener, J.G., 2014

Environmental Science & Technology. Published online 16 May 2014

Wet deposition of mercury decreased considerably in northern Minnesota from 1998-2012. Wet deposition of sulfate and

hydrogen ion—also important in the aquatic mercury cycle—also decreased during the same period. Consistent with decreases in these atmospheric pollutants, two of four study lakes in Voyageurs National Park also showed considerable decreases in methylmercury in water and year-old perch. However, in a third lake, methylmercury levels increased in water and fish; a fourth lake showed no consistent trend.

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mmer 2014 Upcoming Events

September 11, 2014

2014 Clean Water Summit

Green Infrastructure for Clean Water: Costs & Benefits to our Communities

Minnesota Landscape Aroretum

3675 Arboretum Drive, Chaska, MN

MacMillan Auditorium

In Minnesota, water is an important yet vulnerable resource we need to protect. Using green infrastructure to manage runoff in the urban landscape plays an important role in cleaning our water and provides multiple benefits to our communities. The 2014 Clean Water Summit will focus on the costs and benefits of green infrastructure, including the economic, social and ecological factors. Cost-benefit tools and design strategies will be explored, guiding participants towards more local partnerships, more implementation, and cleaner water in our communities.

Register here>>

September 30 - October 2, 2014

Midwest - Great Lakes Society for Ecological Restoration Conference

Lawrence, KS

This conference will include a field trip on Tuesday, September 30th, followed by a day and a half of technical sessions with both oral and poster presentations on Wednesday and Thursday, October 1st and 2nd. The conference draws attendees

from the Dakotas to Kentucky and Ohio to Arkansas, a region that has similar ground-water resource issues as Kansas but has some different aquifer systems and approaches to addressing the resource issues. This is a chance for the results of your project or research to be presented to and discussed with a broader collection of ground-water professionals. More Information here>>

October 20-22, 2014

Upper Midwest Invasive Species Conference

Duluth Entertainment and Convention Center
Duluth, MN

The goal of UMISC is to strengthen management of invasive species, especially prevention, control, and containment. Expected audience includes: researchers, land managers, natural resource professionals, university personnel, landscape and nursery professionals, agriculture and forestry employees, environmental specialists, lake association members, land owners, government agencies, non-governmental organizations, and anyone interested in managing the spread of invasive species in the Upper Midwest. More information here>>

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mmer 2014 Legislative Update

Federal Update: President Obama signed the Water Resources Reform and Development Act (WRRDA) on June 10, 2014. This included a provision to close the St. Anthony Lock and Dam in Minneapolis within one year, as one of the measures the state is taking to prevent the upstream spread of Asian carp species.

We have not seen any further progress in the Congress on the Water Resources Research Act, or our FY15 appropriation.

State Update: The Minnesota State Legislature has passed a bill that authorized and funded the re-creation of the Legislative Water Commission. Eight legislators, two each from the majority and minority parties of the Senate and House, will be selected by the legislative leadership to serve on the Commission. They are charged to become the legislative experts on the complex water resources issues facing the state and to provide leadership to their colleagues on policy development.

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mmer 2014 Community News

Jake Bailey (Earth Sciences, WRS faculty) received a Sloan Research Fellowship, recognizing his research in geobiology. Bailey investigates the interaction of microbes and minerals in oceanic and terrestrial environments, in part to understand the co-evolution of life and lithosphere (rocks and minerals) throughout geologic time. His research involves the use of molecular biology techniques and morphological analysis of modern and ancient microbes to understand the co-evolution of biological and geochemical systems, such may occur in the generation of phosphorous deposits. Bailey also spent March 2014 in Namibia teaching at the University of Namibia's first research discovery camp in oceanography: http://www.microeco.uzh.ch/rgno_namibia/RGNO_Namibia_14.html

John Bilotta (WRC, Sea Grant) presented two papers at the Association of Natural Resource Extension Professionals bi-annual conference in Sacramento CA May 18-22, 2014. He also presented the Watershed Game curriculum and resource and his work in Multiple Approaches to NEMO Program. Bilotta conducted research as part of the NOAA Teacher-at-Sea Program June 17-29, 2014. His work will include remotely operated vehicles and multibeam sonar surveys inside and outside five marine protected areas (MPAs) in the south Atlantic to assess the efficacy of this management tool to protect and help manage fisheries on the continental shelf edge of the South Atlantic Bight between Port Canaveral, FL and Cape Hatteras, NC. Follow Bilotta's research here.

Sara Heger (OSTP, WRC) authored the Milk House Improvement Estimator User's Guide with funding provided by the Legislative-Citizen Commission on Minnesota Resources. The Minnesota State Soil and Water Conservation (BWSR) Agency administers programs that prevent sediment and nutrients from entering our lakes, rivers, and streams; enhance fish and wildlife habitat; and protect wetlands. As part of its reporting duties, BWSR submits data about pollutant load removal and there was previously no standardized approach to reporting these results as required by the legislature. Therefore the Milk House Wastewater Improvement Estimator (MWIE) was developed. It is a spreadsheet-based model that calculates annual pollutant loads from problematic milk house wastewater systems and accounts for the benefits of a range of milk

house wastewater improvements. This tool is intended for use on projects where the producers cannot add the milk house wastewater to liquid manure storage. The Guide provides an introduction to the MWIE, as well as tips and instructions for using it. The Milk House Improvement Estimator Excel file can be downloaded at www.bwsr.state.mn.us/outreach/eLINK/ It can be modified to fit different regulatory requirements and systems across the US.

David Mulla (SWC, WRS faculty) was honored with the Applied Soil Science Research Award at the Annual Meeting of the Soil Science Society of America (SSSA) in Tampa, FL, November 3-6, 2013.The award recognized his pioneering research in water quality and precision agriculture, and is given to only one person in the world each year. Mulla is the first scientist from Minnesota to win this award. Mulla was also appointed to a National Academy of Sciences committee to evaluate water quality monitoring and interstate collaboration with respect to hypoxia in the Gulf of Mexico. The committee organized a workshop held in St. Louis, MO where representatives of federal and state government agencies, research scientists, private companies, and non-governmental organizations discussed 1) current scientific understanding of water quality conditions, 2) scientific uncertainties, relevant issues of time and scale, and priority areas for future water quality monitoring and evaluation, 3) ongoing programs for nutrient management and downstream water quality implications, and 4) institutional frameworks for future water quality evaluation. A report summarizing these findings was published in early 2014 by the National Academy of Sciences.

The McKnight Foundation is funding the development of a web-based Rural Stream Handbook that will be prepared by a team organized by the Water Resources Center. The handbook will assist local conservation staff to describe to landowners how streams and rivers respond to increased flows, and what land and water management practices are available to manage flows. More than half of the sediment leaving the Minnesota River Basin and some other upper Midwest rivers is from streambanks, bluffs, and ravines, primarily during increasingly high flows. The handbook development team includes hydrology, engineering, agronomy, and outreach specialists from the UM, MSU-Mankato, I&S Group, the Pollution Control Agency, and four Soil and Water Conservation Districts. For more information contact Les Everett, evere003@umn.edu, or Ann Lewandowski, alewan@umn.edu at the WRC.

Daniel Wheeler (SWC, OSTP staff) received CFANS Distinguished Teaching Award for undergraduate faculty in a non-tenured position. Wheeler was nominated for the award by Edward Nater, with letters of support from colleagues and students.

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Alana Bartolai received her MS degree in March 2014. Her thesis was titled: A Contribution to a Synthesis Paper for the Great Lakes Futures Project: Investigating Climate Change as a Driver of Change in the Great Lakes St. Lawrence River Basin. Bartolai was advised by **Katsumi Matsumoto**.

Ryan Birkemeier received a travel grant to attend the Upper Midwest Stream Restoration Symposium in LaCrosse, WI, February 23-26, 2014 to present Baseflow Restoration in Minnehaha Creek: Watershed with Stormwater Infiltration. Birkemeier is advised by **Joe Magner** and **John Nieber**.

Hongyu Li received a travel grant to attend the Ocean Sciences Meeting in Honolulu, Hawaii, February 23-28, 2014, to present: The Complementary Use of Wet Extraction Methods with FTIR to Investigate the Seasonal Changes of Sinking Particulate Organic Matter in Lake Superior. Li is advised by **Elizabeth Minor**.

Jiying Li received a travel grant to attend the Ocean Sciences Meeting in Honolulu, Hawaii February 23-28, 2014, and presented: Large lakes as analogues for sediment cycling of carbon and nitrogen in coastal and deep ocean. Li is advised by **Sergei Katsev**.

April Lueck received her MS degree in February 2014. Lueck was advised by **Bruce Vondracek** and **Joe Magner**.

Messias Macuiane received his PhD in April 2014. His dissertation was titled: Cage aquaculture and environment in Lake Malawi: an assessment of water quality, food web shifts, and development of a decision support tool for sustainable aquaculture. Macuiane was advised by **Robert Hecky** and **Stephanie Guildford**.

Jane Mazack was awarded a Sawyer Seminar Graduate Fellowship from the Institute for Advanced Study for the 2014-2015 academic year. The Sawyer Seminar (http://ias.umn.edu/programs/sawyer-seminar/) is funded through the Andrew W. Mellon Foundation and is entitled: “Making the Mississippi: Formulating new water narratives for the twenty-first century and

beyond." In addition to contributing to seminar activities, Mazack will continue her dissertation research, which focuses on the dynamics of winter-active aquatic insects and other macroinvertebrates in southeastern Minnesota's trout streams. As part of her duties, she will be involved in translating empirical results into various different educational media for dissemination to the general public. Mazack also received a travel grant to attend the Joint Aquatic Science Meeting in Portland, Oregon, May 18-23, 2014 where she presented: Overwinter emergence dynamics of adult Chironomidae [Insecta: Diptera] in groundwater-fed streams of southeastern Minnesota. Mazack is advised by **Bruce Vondracek** and **Leonard Ferrington**.

Paul Venturelli (Assistant Professor, FWCB) and **Sam Kelly** (Assistant Professor, Large Lakes Observatory, Duluth) have joined the Water Resources Science faculty.

Mohd-Rozham Zakaria received a travel grant to attend the Ocean Sciences Meeting in Honolulu, Hawaii February 23-28, 2014, to present: Sedimentary Fluxes of Great Lakes of Different Latitude Determined Using Moored Sequential Sediment Traps. Zakaria is advised by **Robert Hecky** and **Stephanie Guildford**.

Xiaowei Zhao received a travel grant to attend the Joint Aquatic Science Meeting in Portland, Oregon, May 18-23, 2014 to present a poster: Relationships between bacterial biodiversity and environmental parameters along an estuarine transect from the lower St Louis River to nearshore Lake Superior. Zhao is advised by **Randall Hicks**.

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